High Frequency Chest Wall Oscillation (HFCWO) Data Analysis in the Bronchiectasis and Nontuberculous Mycobacteria (NTM) Research Registry (BRR)

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INTRODUCTION

- Bronchiectasis (BE) is a chronic respiratory disease with multiple etiologies including other chronic respiratory diseases (e.g., asthma, COPD).
- Clinically-significant BE is characterized by cough and sputum production and recurrent exacerbations.
- Airway clearance is a key management feature recommended in international guidelines. Of a host of treatment options, high frequency chest wall oscillation (HFCWO) was associated with improved BE management.

METHODS

- We analyzed cross-sectional data from the Bronchiectasis and Nontuberculous Mycobacteria Research Registry (BRR) to understand baseline demographics, clinical characteristics, and bronchial hygiene among BE patients with and without HFCWO devices (**Aim 1**).
- We subsequently analyzed **Aim 1** patients not prescribed HFCWO devices at baseline to determine differences between those who did and did not meet CMS criteria for HFCWO (i.e., having a productive cough defined as patient-reported daily cough for at least 2 years prior to baseline assessments, or at least 2 exacerbations per year) (**Aim 2**).
- Patients meeting **Aim 2** inclusion with at least 1 year of follow-up over a 3-year period were evaluated for incident HFCWO therapy and the incidence of key clinical outcomes (**Aim 3**).
- Statistical Analysis: Differences between groups for all aims were compared using Wilcoxon-Mann-Whitney test and independent two-sample t-tests for continuous variables and chi-square tests for categorical variables.

RESULTS: Baseline Characteristics

At baseline, BRR patients prescribed HFCWO had some key differences (**Aim 1**) from patients not prescribed HFCWO (**Figure 1 and Table 1**).

Table 1: BE Patient Demographics (AIM 1)

	HFCWO n=518	Non-HFCWO n=5155
Demographics (similar groups without meaningful differences)		
Age, median (yr.), [IQR]	68 [58-75]	69 [61-76]
Female (n=5663), n (%)	424 (82.0)	4086 (79.4)
Race and Ethnicity (n=5275) , n (%)		
non-Hispanic White, n (%)	438 (87.1)	4153 (87.0)
non-Hispanic Black, n (%)	18 (3.6)	138 (2.9)
Hispanic, n (%)	13 (2.6)	162 (3.4)
Asian, n (%)	27 (5.4)	204 (4.3)
Other, n (%)	7 (1.4)	115 (2.4)
Clinical Characteristics (all differences between groups, p<0.001)		
Hemoptysis (n=5598) , n (%)	139 (27.1)	1008 (19.8)
≥1 pulmonary-related hospitalization within 2 years prior to enrollment (n=5566) , n (%)	138 (27.0)	928 (18.4)
Received antibiotics for chronic suppression (n=3206) , n (%)	148 (29.0)	331 (12.3)

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Abbreviations: ABPA=Allergic Bronchopulmonary Aspergillosis, CMS=Centers for Medicare and Medicaid Services; COPD=Chronic Obstructive Pulmonary Disease, GERD=Gastroesophageal Reflux Disease, NTM=Nontuberculous Mycobacteria, PCD=Primary Ciliary Dyskinesia, ROSE=Radiology, Obstruction, Symptoms, Exposure

RESULTS: Cross-Sectional Analyses Shows More Severe Disease in Patients Prescribed HFCWO

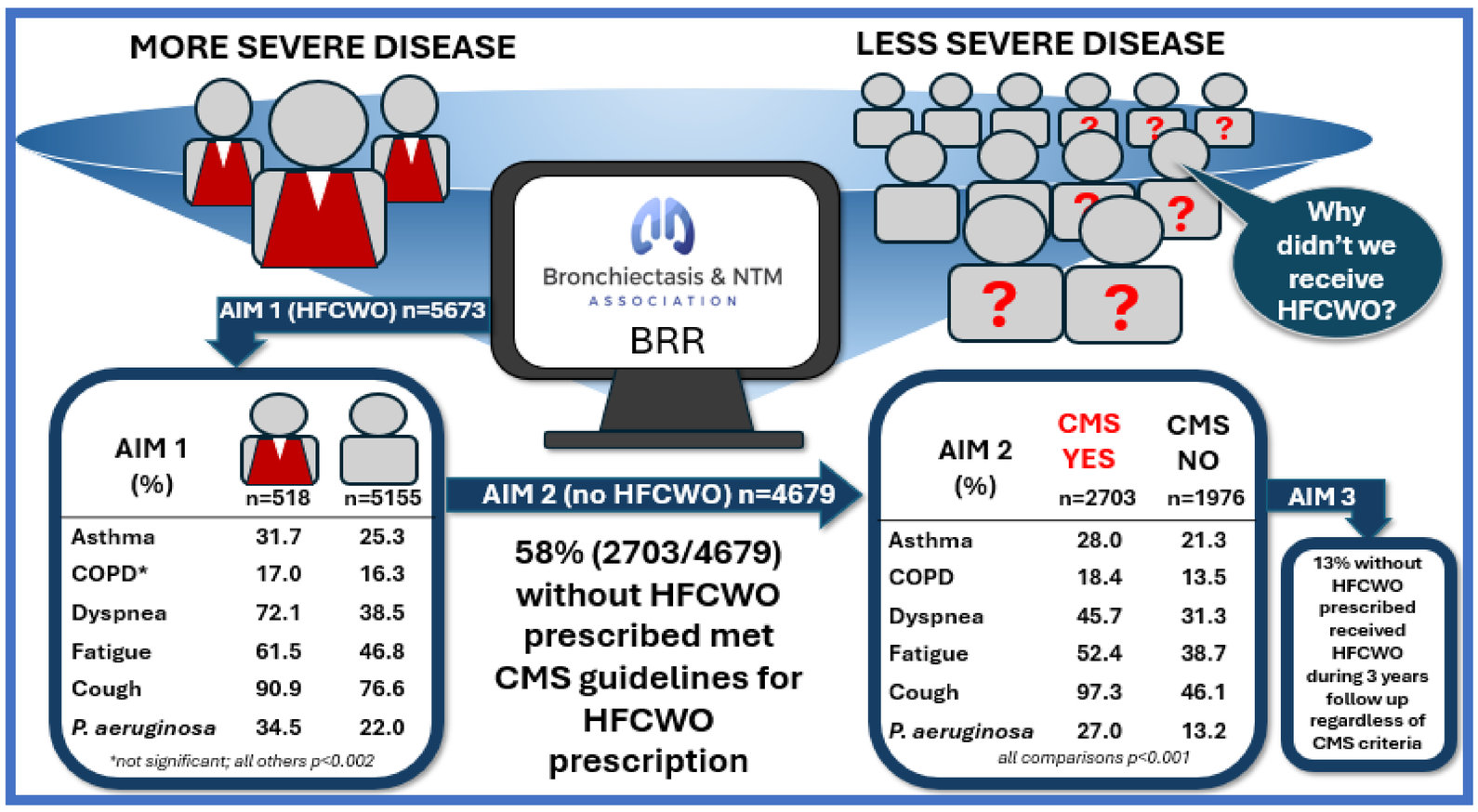

Figure 1: Retrospective review data for Aims 1, 2 and 3

Table 2: BE Patient Characteristics (AIM 1)

Does BE patient use HFCWO?	HFCWO n=518	Non-HFCWO n=5155	p-value
Co-morbidities and etiologies			
GERD (n=5646), n (%)	251 (48.5)	2148 (41.9)	0.004
PCD (n=5634), n (%)	30 (5.8)	106 (2.1)	<0.001
ABPA (n=4183), n (%)	17 (3.3)	62 (1.7)	0.013
NTM (n=4515), n (%)	104 (20.1)	628 (15.7)	0.011
Severity Index and Therapeutics			
mBSI Score, median (IQR)	8 [5-11]	7 [4-10]	<0.001
Inhaled bronchodilators (n=3330), n (%)	449 (87.0)	1854 (65.9)	<0.001
Hypertonic saline (n=4051), n (%)	438 (85.0)	2027 (57.3)	<0.001
Inhaled corticosteroids (n=5656), n (%)	210 (40.5)	1688 (32.9)	<0.001
Oral corticosteroids (n=5651), n (%)	149 (28.8)	806 (15.7)	<0.001

Table 3: BE Patient Characteristics (AIM 2)

Dose patient meet CMS Criteria?	Meets Criteria n=2703	Criteria not met n=1976	p-value
Co-morbidities and etiologies			
COPD, ROSE criteria (n=4644), n (%)	188 (7.0)	54 (2.7)	<0.001
GERD (n=4659), n (%)	1162 (43.2)	792 (40.2)	0.045
PCD (n=4646), n (%)	64 (2.4)	10 (0.5)	<0.001
ABPA (n=3356), n (%)	43 (2.2)	17 (1.2)	0.030
Therapeutics			
Antibiotics for chronic suppression (n=2574), n (%)	238 (15.9)	81 (7.5)	<0.001
Inhaled bronchodilators (n=2660), n (%)	1131 (72.5)	622 (56.5)	<0.001
Hypertonic saline (n=3262), n (%)	1263 (64.6)	598 (45.8)	<0.001
Inhaled corticosteroids (n=4672), n (%)	983 (36.4)	503 (25.5)	<0.001
Oral corticosteroids (n=4668), n (%)	518 (19.2)	221 (11.2)	<0.001

- BRR patients prescribed HFCWO had a greater proportion of common co-morbidities and BE etiologies with more severe disease characteristics and severity indexes. In addition, patients prescribed HFCWO were more likely to be prescribed additional therapeutics **(Table 2**).
- Of Aim 2 patients not prescribed HFCWO at baseline, most (58%, 2,703/4679) met CMS guideline criteria for HFCWO therapy (**Figure 1**) and were more likely to have severe disease **(Table 3).**
- During follow-up, HFCWO was prescribed to 12.9% (220/1709) whether they met CMS criteria (14.0%) or not (11.0%) (p=0.073) and the patients prescribed HFCWO during follow up tended to be more unstable (**Figure 2**).

RESULTS: Clinically Unstable Patients at Follow-up are more often Prescribed HFCWO

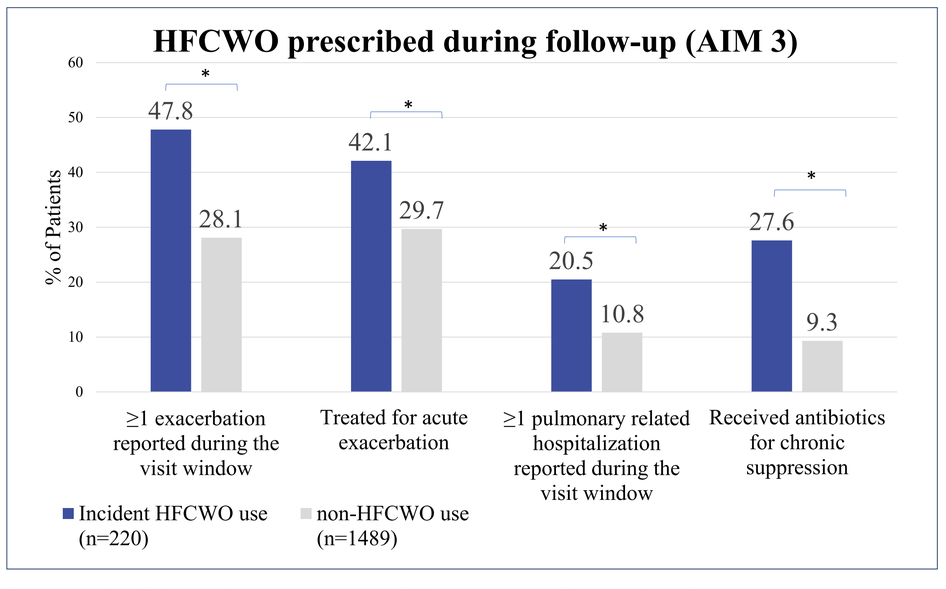

Figure 2. Clinical outcomes at follow-up (1-3 years) of patients prescribed HFCWO vs patients not prescribed HFCWO; *p<0.001 for all comparisons

CONCLUSIONS

- In this cross-sectional BRR analysis, BE patients already prescribed HFCWO at baseline had more severe disease.
- The majority of patients without HFCWO prescriptions at baseline met CMS criteria for HFCWO prescription and had similar baseline characteristics to patients already on HFCWO.
- Preliminary analysis of longitudinal outcomes indicated a possible need for education on HFCWO prescribing indications and guidelines.
- Our findings indicate a clinically more severe BE patient population were offered HFCWO selectively.